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ABSTRACT

This paper is a response to a presentation by Joseph Pelton at the 15th World Congress on Distance Education (Caracas, Venezuela, November 1990). The response argues that, while newer technologies will impact on distance education, they will not be the panacea suggested by Pelton. The response also points out that not all "new" technologies are interactive or "two-way": but they will impact on both existing and new distance teaching institutions. However, if interactivity is to be maintained, this will be mainly for courses with relatively low numbers for many developing countries. Print-base courses will remain essential, both for economic and quality reasons. Americans need to be aware that "tele-education" is not the only, nor even the most effective, form of distance education. (DB)

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THIRD GENERATION DISTANCE EDUCATION: THE CHALLENGE OF NEW TECHNOLOGY

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A response to Joseph Pelton's paper:
'Technology and Education: Friend or Foe'
presented to the
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Caracas,
Venezuela

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'A pedestrian who is hit by a car doesn't say: "This is simply a case of technology versus people." He wants to know who was in the driver's seat.'

Kling, 1983

The impact of the information society on distance education

At the International Council of Distance Education's XV World Conference in Caracas in 1990, Joseph Pelton, of the University of Colorado, USA, presented a paper that offers a provocative challenge to distance educators (Pelton, 1990). The paper is a good example of the rather breathless style of futurism found in North America, from prophets such as Alvin Toffler and Carl Sagan: wide-ranging, full of attention-grabbing 'mega-statements' and both dire and optimistic statements about the new post-industrial 'information society' now rushing upon us. What made the paper of particular interest to distance educators was that Pelton applied this kind of thinking to the educational context.

His main point is that 'tele-education' (the application of new telecommunications and computer technology to education) provides an opportunity to solve many of the major educational problems facing the world. While acknowledging some of the potential dangers inherent in such technologies, Pelton argues that they provide the opportunity for global networking, increased interactivity and more control for learners, in a highly cost-effective manner. The implicit message in Pelton's paper is clear: this form of technological approach will be the way forward for education in the future; all we, as distance educators, have to do is to learn how best to embrace it.

Despite my conviction that such technologies do indeed hold great promise for distance education, I found myself reacting quite strongly to the paper. It is not just my old-fashioned objection to the invention of a bastard word mixing Greek and Latin origins (after all, we have all got used to 'television'), nor even to the attempt to use the term 'tele-education' to suggest that something new has been invented in the USA when in fact it merely describes developments which had started much earlier elsewhere. My main concern is well captured by Kling's comment above. I want educators - rather than technological idealists - to be in the driving seat, and above all I want to make sure that learners are not run over by the technology.

To set out my concerns, I want to ask - and try to answer - three questions:

- how does what Pelton calls 'tele-education' relate to distance education as I understand it?
- how relevant is 'tele-education' for developing countries?
- what will 'tele-education' do for the quality of learning?

Tele-education and distance education

To answer my first question, I will draw on Søren Nipper's classification of the three 'generations' of distance education (Nipper, 1989).

1. Correspondence teaching/single media

In the beginning was correspondence teaching. This was characterised by little or no production of materials; rather, students were given a reading list, and a set of sample questions, which correspondence tutors marked. With luck, the student may have received some helpful comments from the tutor, before sitting the same examination as full-time, internal students. Such education was characterised, in general, by high drop-out.

Later, radio then television came along. Even though broadcasts were often accompanied by other media such as print, and even linked to local face-to-face classes, these were ancillary activities, driven by the media of the broadcasting agency, rather than curriculum requirements. Broadcast-based courses were rarely linked to the acquisition of formal qualifications.

2. Multi-media distance education

Then, in 1969, came the British Open University. For the first time, a deliberately integrated multi-media approach was adopted, to produce fully qualified graduates, even though the predominant medium was, and remains, print.

The Open University was the first incarnation of what Peters (1983) has described as the 'industrial' model of distance education. This is characterised by the use of 'one-way' media (print, broadcasting, cassettes), with the 'two-way' communication still being provided by correspondence tutors, or face-to-face tutorials. Another characteristic of the industrial model is high fixed costs associated with developing courses, and low variable costs, in that the cost of each additional student is low, once materials are created. Because of the high fixed costs, large numbers of students are required to justify the costs. The Open University, and many others created since, are autonomous (or single-mode), in that they award their own qualifications, and are 'dedicated' to distance education.

Dual-mode institutions, i.e. those that as well as teaching on-campus also offer courses at a distance, have had a harder struggle in providing courses based on the 'industrial' model, not only because of the problems of much smaller student enrolments for distance courses than in the single-mode institutions, but also because of the lower priority or status often given to distance education in these institutions. Despite - or perhaps because of - these difficulties, dual-mode institutions have often been more ready to use some of the more interactive technologies as a central part of their distance teaching.

3. Tele-education and 'third generation' distance education

Some (but not all) of what Pelton calls tele-education is encompassed by Nipper's 'third generation' of distance education. This is based on the use of electronic information technologies, but not just in the 'one-to-many' form of print and broadcasting. These third-generation technologies, using telecommunications and computers, provide far greater facility for two-way communication, resulting in a much more even access to communication between student and teacher (and also between students). Typical technologies are computer conferencing or networking, and audio- and video-conferencing (including audio-graphics).

Courses based on these technologies are characterised by relatively low fixed costs, since they provide easy access to teachers without the need for high-cost development of materials, and relatively high marginal costs, since telecommunications and teacher costs increase in proportion to the number of students (if a high degree of interactivity is to be maintained). For this reason, third generation technologies allow courses to be tailored to fit the needs of relatively small numbers.

However, Pelton's definition of 'tele-education' unfortunately also includes electronic technologies of a primarily one-way (if large-scale) nature, such as broadcast satellites, thus encompassing all electronic forms of communication. In so doing, he is mixing together some very different kinds of educational activity. We are all familiar with educational broadcasting, which has existed for over 60 years. Merely using a satellite to increase the size of the potential audience does not change the nature of the educational experience, although there are, as Pelton points out, opportunities and dangers in the crossing of national boundaries which the new technologies now permit. Pelton's definition however also includes the use of 'narrowcasting', i.e. the use of satellite or cable to relatively small numbers of students at a distance, with an element of interaction built in through telephone links from remote students to a central teacher.

However defined, those technologies that form the foundation of the 'information society' will clearly impact on education, and particularly distance education, as powerfully as they are already doing in business and industry.

The impact of new technologies on distance education

Established institutions

The new interactive technologies present some fundamental challenges for the many established, large-scale, autonomous distance teaching institutions based on the industrial model. How will they adapt to take advantage of these new technologies?

Distance teaching institutions based on the industrial model suffer from the disadvantage that their whole organisation, and especially their management and decision-making process, is built around the requirements of the mass production of 'one-way' teaching materials. Consequently, innovation is extremely difficult, and the newer technologies, when introduced, tend not to be used to replace existing technologies such as print, but merely to supplement them, thus adding to costs, and more seriously, increasing student work-load. This was certainly the experience of the British Open University, when it introduced computer conferencing for the first time (see Mason, 1989).

Secondly, the same conditions that lead to successful use of the newer interactive technologies in business and commerce will also apply to educational institutions wishing to use these technologies. The 'information society' is based on and requires fast, flexible and devolved decision-making and management, and thus radically different organisational structures and methods of working from those found not only in conventional education systems but also in the large, autonomous distance teaching universities. For instance, the 'collegiate' model of decision-making appears difficult to reconcile with the requirements of the newer technologies; if educators are to remain in control of the technology, alternative, but equally participative, models of decision-making are necessary.

New institutions

Distance education is still a rapidly growing area of activity. New institutions are being created all the time, in both developed and developing countries. Should new institutions leap-frog straight over the industrial model, into systems designed specifically to exploit the new information technologies?

This, as Pelton points out, is certainly happening in the USA. Although most 'tele-education' initiatives in the USA have so far been of limited duration and success, this is more a function of the nature of educational funding in the USA than of the inherent short-comings in the technologies. Another feature of many projects in the USA that Pelton describes as 'tele-education' is their over-reliance on a single technology, such as the satellite relaying of classroom lectures. Again, however, this is not inevitable, and could be seen as part of the learning curve in how to teach at a distance in a country where distance education has been slow to develop. The important point though is that it will be easier to create new educational organisations based on the new technologies, than for the large established 'industrial' distance teaching institutions to adapt to the new technologies.

Even if 'tele-education' is successful in certain contexts, though, are there circumstances where the industrial model is still more appropriate? For many developing countries, this is a question of crucial significance. In the last two years, five major new distance education institutions have been established in SE Asia alone. I will return to this question shortly.

Comparative costs of tele-education and industrial models of distance teaching

One of my major concerns with Pelton's paper is his failure to address the issue of costs (although he does discuss the often unequal access to the new technologies). The new technologies require heavy investment in the basic infrastructure of telecommunications networks and equipment provision. However, once these are in place - usually for commercial rather than educational reasons - the cost structure for the third generation technologies appears, at first sight, to be very different from that for the industrial distance teaching institution.

Technology costs in distance education can be broken down into three main components:

- delivery: the costs of getting teaching materials to students; these can be television transmission costs, telephone costs, mailing costs, etc.;
- production: the costs of creating teaching materials: these would include the costs of teachers developing materials, television or computer-assisted learning production costs, etc.
- support: the additional costs needed to ensure that the system works successfully; these can be administrative costs, such as registration and examinations, local support costs, such as local tutors or counsellors, and institutional overheads, such as building costs, etc.

In the industrial model of distance teaching, the cost structure varies from institution to institution, but in general is something like this:

delivery	1 unit
production	10 units
support	10-20 units

Unfortunately, the cost structure of third generation distance education is less well understood at the moment. One of its more obvious attractions, though, is that it reduces dramatically the *production* costs of teaching at a distance. Teachers or experts can be accessed without the need for a great deal of production and development. Thus production costs are probably at the equivalent of around 1-2 units compared with the industrial model's 10.

Delivery costs for the new interactive technologies are also very different from those for the industrial model, both in actual amounts and in their structure. Delivery costs in the industrial model are more or less fixed, i.e. independent of the number of students. For instance, printing costs are a small proportion of print development costs, (and are more than covered by additional income from student fees); a television transmission costs the

same, whether it is seen by one or a million people. In 'tele-education' though delivery costs increase more or less in proportion to the number of students, *if the level of interactivity is to remain constant.* This is because not only student equipment and telecommunications costs rise in proportion to the number of students, but also because the number of teachers needed increases, if the level of interactivity is to remain constant.

Some 'tele-education' initiatives attempt to provide the opportunities for interaction locally, through the use of peer groups and local site co-ordinators. These however should be considered as support costs, and again rise in proportion to the number of students (as in the industrial model). I have an uneasy feeling that if the full support costs of tele-education are included, the cost advantages over the industrial model may not always be so apparent.

Third generation technologies are particularly valuable where relatively small numbers of students are concerned, since they avoid the high fixed production costs of the industrial model, but they do not however bring the economies of scale of the industrial model, unless the opportunities for interaction for an individual student are dramatically curtailed.

Relevance of tele-education for developing countries

One of the major claims made by Pelton for tele-education is that it can help tackle the huge demand and need for education and training in developing countries.

In assessing this claim, it is important to point out that developing countries are not homogeneous. Two important dimensions are wealth and size. There are rich as well as poor developing nations; many developing countries are very small in size, such as island states, while others are very large, encompassing sub-continents.

It is certainly true that with a great deal of effort, countries such as India and China have been able to use satellite technology in particular for educational purposes. However, India, through first the SITE experiment then later with its own satellite, INSAT, has found that the ground costs far exceed the satellite costs for education. It has also found that it has had to decentralise production through 15 educational production centres, for language and cultural reasons, thus reducing some of the economies of scale. India has in fact preferred to go for a more integrated approach to distance education, more akin to 'second generation' distance education, through its open universities. China's television universities are more like 'first generation' distance teaching, using television lectures supported by local face-to-face tutorials, although efforts are being made to provide a more integrated approach with print. Neither of these countries though has yet been in a position to apply the more interactive third generation technologies, because of the huge numbers, the lack of an appropriate technological infra-structure, and the very high costs.

Small countries, with relatively small numbers of students, are in a better position to use the more low-cost interactive technologies, such as audio-conferencing and audio-graphics, though even in areas where these have been introduced, such as the University of the West Indies and the University of the South Pacific, costs have been a major inhibitor to use.

In general, though, most developing countries have chosen to opt for the industrial model of distance education, incorporating a range of 'older' technologies, and based on print as the main medium.

Does this mean then that 'tele-education' will further increase the gap between developed and developing countries? Not necessarily, because there is as yet no empirical evidence that tele-education is more effective than the industrial model of distance education, when applied to very large numbers. This is perhaps the key issue, which is addressed in the next section.

Tele-education and the quality of distance education

What is the nature of tele-education, as defined by Pelton? As already noted, there are two quite different characteristics of tele-education: the low-cost use of media to extend the teacher beyond the classroom walls, to very large numbers of students; and the use of technology to allow for more interaction between teachers and learners at a distance. I wish to challenge the assumption that either of these approaches automatically leads to more effective teaching than the industrial model of distance education.

Lectures at a distance

One key difference between 'traditional' educational broadcasting and the mass-media use of tele-education is that the latter is much cheaper, since it is based on putting teachers in front of the technology, rather than producing programmes that deliberately exploit the presentational qualities of the video medium, which are expensive to make. This assumes though that the classroom method of a lecturer delivering information is an adequate teaching model. There is a good deal of evidence and theory to suggest that this is true only when students are already highly motivated, are highly skilled and practiced in learning, and already thoroughly understand the key concepts in a subject area. It is not surprising then that the most successful uses of this model of tele-education in the USA has been for post-graduate and professional education. A good example is the National Technological University, which delivers via satellite lectures from leading researchers and experts in their field to post-graduates in the corporate sector. The success of televised lectures has yet to be established for adults returning to study for the first time, for basic levels of education, or for students new to a subject area. In all of these areas, though, the industrial model has an excellent record of success.

Indeed, perhaps the most significant contribution that the industrial model of distance teaching has made to education is to develop a method that leads to coherent, comprehensive, accurate, integrated and highly effective learning materials specifically designed for independent study. For many of us, it would be a retrograde step to return to a method based on the efforts of an individual teacher working in isolation, and where the student is dependent on being present both at a set time and place, even though this may be remote from the teacher. This is perhaps the most significant difference between 'tele-education', as practiced in the USA, and distance education, as practiced elsewhere in the world.

Interactivity and the new technologies

I believe then that it will not be from technologies based on relaying lectures that the main advance in distance education will come, but rather on those that provide for increased interaction for the learner. The lack of convenient and effective interaction for independent learners has always been a weakness of the industrial model of distance teaching.

However, interactivity, like quality, is one of those buzz-words which are bandied around without a great deal of care being given to what it actually means (see Bates, 1990, for a fuller treatment of this issue). There are basically two very different kinds of interactivity in learning. The first is an *individual*, private activity between the learner and the learning material, which may range from a sand-tray for children in a kindergarten, to a computer-assisted learning programme for a university undergraduate. The second is a *social* activity, between the learner and a teacher or tutor, or with other learners. A great deal of care has been taken in the industrial model to provide opportunities for both individual and social interaction, but it has always been costly and difficult to do this, particularly for social interaction. The *balance* needed between individual and social interaction is an important issue to be resolved by research, although I would bet that there are large variations between individuals in their needs. However, few would argue about the importance of both kinds of interactivity for learners.

The important point though is that it is not enough to use the new 'third generation' technologies merely to connect people together. Anyone who has attended a video conference linked into an audience of several hundred at a remote site will understand immediately the paucity of the interaction that takes place; most members of the audience are excluded from any form of interaction other than just watching or listening to the remote speaker. Similarly, while computer conferencing is my favorite technology, there is nothing more depressing than to log on to 'content-free' conferences, containing little but chit-chat between participants, or the exchange of personal opinions unrelated to any conceptual or pragmatic development.

It is even more important then that the interactive technologies are organised for relatively small groups, and that careful attention is given to structuring and moderating the interaction that takes place. Thus the new

interactive technologies not only require sophisticated equipment and communications systems, but they also require highly skilled teachers, and in large numbers, if high levels of interactivity are to be maintained at a social level. Furthermore, third generation technologies are unlikely on their own to provide the full range of learning required for a particular subject area. For these reasons, then, such technologies are not likely to be an immediate answer to the problems of mass education in poor or even developed countries.

Summary

There is clearly a niche for 'tele-education', as defined by Pelton, although it is the more interactive technologies such as audio- and computer-conferencing that appear to have most promise for distance education, rather than the delivery of tele-lectures to large numbers via satellite. Tele-education then will not make the industrial model redundant, particularly in developing countries with very large numbers to educate, any more than the information society will replace the need for manufactured goods. Third generation technologies though will require some radical changes in the management and structure of distance teaching institutions, and those that fail to adapt will find themselves under increasing pressure from new institutions set up specifically to exploit these technologies.

Secondly, there is no one super-technology for distance education. Pelton himself points out that tele-education should be only a part of a whole, and needs to be integrated with other media such as text-books. The choice of technology will still be complex, dependent on a combination of the needs of students and the subject matter, costs, and the desired teaching approach. The newer interactive technologies are both widening choice, and making it more difficult to make decisions.

Thirdly, Pelton's argument, and I hope my critique of it, merely illustrate the need for far greater sophistication in decision-making about the use of technology for distance education. It is not a simple process, and the price of error can be great. There is an obligation on both those that fund and on those that manage distance education to understand the strengths and limitations of different technologies, and above all to have an adequate framework or process that leads to appropriate decisions being taken.

Lastly, technological decision-making is not just a rational process. It is influenced by cultural and ideological pressures as well. My major concern about Pelton's paper is that it assumes that 'tele-education' is automatically appropriate for the whole world. However, the tele-education model is a product of the educational, political and cultural environment of the USA - as of course is the Open University a product of the British environment. Other forms of distance education are not only possible, but desirable. It is necessary for each educational jurisdiction to choose and apply distance teaching models, and the technology that supports them, to suit the unique

conditions of that jurisdiction. Only in this way will educators be in control, and avoid mowing down their students in the name of progress.

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